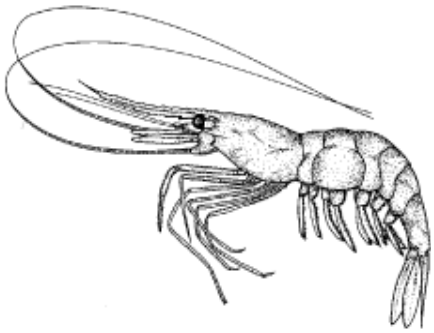

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Northern Shrimp

by
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Northern or pink shrimp, *Pandalus borealis*, are distributed discontinuously throughout boreal waters of the North Atlantic, North Pacific, and Arctic Oceans. In the Gulf of Maine, northern shrimp are considered to comprise a unit stock. They inhabit soft mud bottom at depths of approximately 10 to 300 m (2 to 165 fathoms), most commonly in the cold waters of the southwest Gulf of Maine. The Gulf of Maine is the southern limit of the species' distribution in the North Atlantic, and temperature is an important factor in ontogenetic rates and reproductive success for this stock.

Northern shrimp are protandrous hermaphrodites. In the Gulf of Maine, they generally spawn as males in their third summer; they subsequently undergo transition and become mature females in their fourth year. After spawning and egg extrusion in summer, ovigerous females move to coastal waters in late autumn, where eggs hatch in wintertime. Juveniles remain inshore for more than a year and then migrate offshore as they begin to mature.

A directed otter trawl fishery for northern shrimp began in coastal waters of the Gulf of Maine during the winter months in the 1930s. In the 1960s, landings rose rapidly to a peak of 12,800 mt in 1969 with the expansion of an offshore, year-round fishery; and approximately 11,000 mt were landed annually from 1970-1972. After 1972, landings declined rapidly, leading to increasingly restrictive management measures and closure of the fishery in 1978. The current fishery , primarily a trawl fishery (with a small coastal trap fishery in central Maine), reopened in 1979 and landings increased gradually to 5,000 mt for 1987; the 1988-1994 annual average was 3,400 mt. Landings then increased to 6,800 mt in 1995 and to 9,500 mt in 1996. The latter figure has been exceeded only during the peak years of the fishery just prior to the 1970s stock collapse. Landings then declined from 6,300 mt in 1997 to 1,700 mt in 1999 and then rose to 2,400 mt in 2000 with recruitment of the 1996 year class. A delayed start to the 2000 season allowed the fishery to fish inshore on aggregated concentrations of shrimp, with a sharp rise in commercial catch per unit effort or CPUE compared to preceding seasons.

Nominal fishing effort increased in the late 1960s to an average of 16,000 trips for the 1970-1972 fishing seasons. Effort decreased rapidly in the 1970s, but has increased considerably since the 1978 closure. The number of trips peaked at over 12,000 in the 1987 season, decreased to about 6,000 trips in 1994, and again increased to about 12,000 trips during the 1996 season. Since then, the number of trips has steadily declined to 3,400 trips in 2000.

The fishery is managed via gear restrictions and seasonal limits (set within a 183-day "window" from December through May) under the authority of the Atlantic States Marine Fisheries Commission (ASMFC). For 2001, the Commission has established a split season of 83 days, extending from January 9 -March 17 and from April 16-30.

Stock biomass is currently monitored by the NEFSC autumn bottom trawl survey and the ASMFC summer shrimp survey. The NEFSC autumn survey biomass index declined to very low levels during the late 1970s and has since increased somewhat. Stock biomass for 2000 as estimated from a modified DeLury model (6,000 mt) was well below the 1986-1995 average of 17,000 mt. Abundance of large shrimp at the end of the 1996 fishing season was the lowest since the early 1980s, with a slight increase through 1999, probably in response to decreased effort and exploitation during the late 1990s. Exploitation rates during fishing seasons increased from 8% to 29% from 1985-1995 and then to 52% during the 1997 season before declining to 18% during 2000. This decline is consistent with the decline in nominal effort during the same period. Exploitation rates at or near the 1997 level occurred in the late 1960s and early 1970s just prior to the time of the stock collapse. Continued exploitation at the 1997 level would increase the potential for overfishing and resultant declines in abundance and recruitment.

For further information

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Summary Status

Long-term potential catch(MSY)	=	5,000 mt
Biomass corresponding to MSY	=	31,000 mt
Minimum biomass threshold	=	Unspecified
Stock biomass in 2000	=	6,000 mt
Overfishing definition	=	None [1]
$F_{1999\text{-}00}$	=	0.34
Age at 50% maturity (females)	=	3½ years
Size at 50% maturity (females)	=	26 mm carapace length (1.0 in.)
Assessment level	=	Stage-structured (DeLury)
Management	=	Interstate FMP for northern shrimp(ASMFC)

$M = 0.25$ $F_{0.1} = 0.46$ $F_{max} = 0.77$ $F_{40\%} = 0.34$

[1] SARC-25 recommended an interim management target F equivalent to the 1985-1995 mean of 0.34, which was associated with relatively stable stock biomass levels. This F level corresponds to 40% of maximum egg production per recruit.

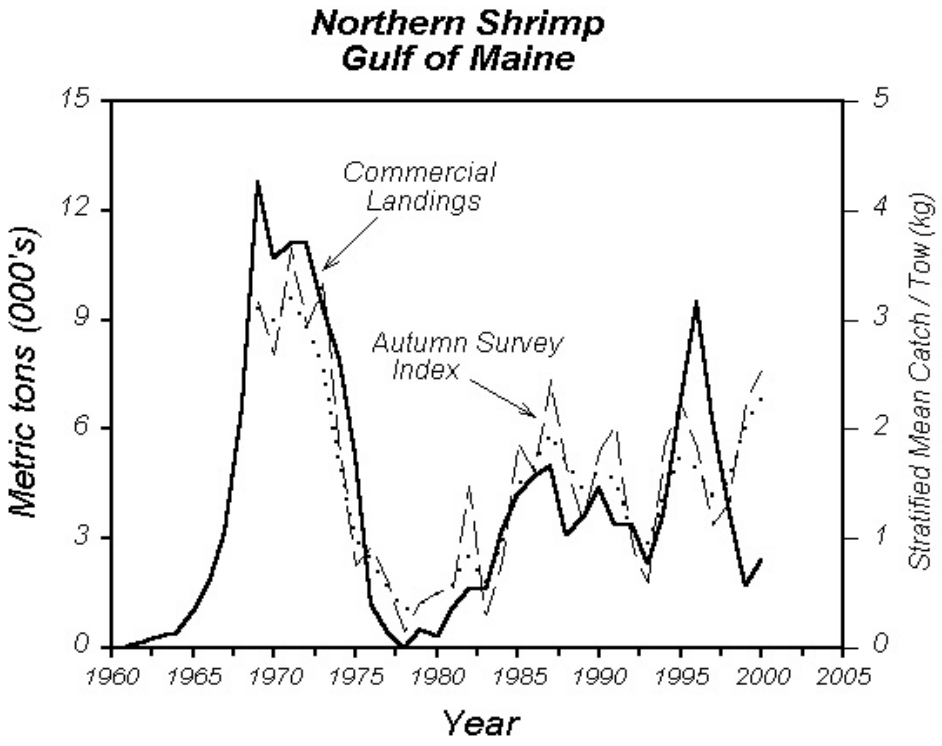

Table 30.1 Recreational catches and commercial landings (thousand metric tons)

		Year									
Category	**1981-90 average**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
U.S. recreational	-	-	-	-	-	-	-	-	-	-	-
Commercial											
United States	3.2	3.4	3.4	2.3	3.7	6.8	9.5	6.3	3.7	1.7	2.4
Canada	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-
Total nominal catch	3.2	3.4	3.4	2.3	3.7	6.8	9.5	6.3	3.7	1.7	2.4